We claim:

1. A semiconductor structure comprising:

a monocrystalline substrate;

an amorphous intermediate layer formed overlying said substrate;

a binary metal oxide material layer formed overlying said amorphous intermediate layer; and

a monocrystalline material layer formed overlying said binary metal oxide material layer.

2. The semiconductor structure of claim 1, wherein said binary metal oxide material layer is formed of a binary material oxide material having a rock-salt crystalline structure.

3. The semiconductor structure of claim 1, further comprising a template layer formed overlying said binary metal oxide material layer and underlying said monocrystalline material layer.

4. The semiconductor structure of claim 1, wherein said substrate comprises silicon.

5. The semiconductor structure of claim 1, wherein said substrate comprises a (001) semiconductor material having an orientation from about 2 degrees to about 6 degrees offset toward the (110) direction.

6. The semiconductor structure of claim 1, wherein said binary metal oxide material layer is formed of at least one of: BaO, SrO, MgO, CaO, ZrO2, CeO2, PrO2, YSZ and an oxide blend comprising at least two of Ba, Sr, Mg, Ca, Zr, Ce, and Pr.

7. The semiconductor structure of claim 1, wherein said monocrystalline material layer comprises at least one of a semiconductor material, a compound semiconductor material, a metal, an oxide, and a non-metal.

8. The semiconductor structure of claim 3, wherein said template layer comprises a Zintl-type phase material.

9. The semiconductor structure of claim 8, wherein said Zintl-type phase material comprises at least one of $SrAl_2$, $(MgCaYb)Ga_2$, $(Ca,Sr,Eu,Yb)In_2$, $BaGe_2As$, and $SrSn_2As_2$.

10. The semiconductor structure of claim 3, wherein said template layer comprises a surfactant material.

11. The semiconductor structure of claim 10, wherein said surfactant material comprises at least one of Al, In, Bi, and Ga.

12. The semiconductor structure of claim 10, wherein said template layer further comprises a capping layer.

13. The semiconductor structure of claim 12, wherein said capping layer is formed by exposing said surfactant material to a cap-inducing material.

14. The semiconductor structure of claim 13, wherein said cap-inducing material comprises at least one of As, P, Sb and N.

15. The semiconductor structure of claim 1, wherein the binary metal oxide material layer comprises a binary metal oxide material formed as a monocrystalline binary metal oxide and subsequently heat treated to convert the monocrystalline binary metal oxide to an amorphous binary metal oxide.

16. The semiconductor structure of claim 1, wherein said monocrystalline substrate is characterized by a first lattice constant, said monocrystalline material layer is characterized by a second lattice constant that is different from said first lattice constant, and said binary metal oxide material layer is characterized by a third lattice constant that is different from said first and said second lattice constant.

17. The semiconductor structure of claim 2, wherein said substrate comprises silicon and said amorphous intermediate layer comprises a silicon oxide.

18. A semiconductor structure comprising:

a monocrystalline substrate;

a strained stack overlying said substrate, said strained stack comprising:

a first binary metal oxide material layer; and

a second binary metal oxide material layer overlying said first binary metal oxide material layer; and

a monocrystalline material layer formed overlying said strained stack.

19. The semiconductor structure of claim 18, further comprising an amorphous intermediate layer formed overlying said substrate and underlying said strained stack.

20. The semiconductor structure of claim 18, further comprising a template layer formed overlying said strained stack and underlying said monocrystalline material layer.

21. The semiconductor structure of claim 18, wherein said substrate comprises silicon.

22. The semiconductor structure of claim 18, wherein said substrate comprises a (001) semiconductor material having an orientation from about 2 degrees to about 6 degrees offset toward the (110) direction.

23. The semiconductor structure of claim 18, wherein said first binary metal oxide material layer is formed of at least one of BaO, SrO, MgO, CaO, ZrO_2, CeO_2, PrO2, YSZ and an oxide blend comprising at least two of Ba, Sr, Mg, Ca, Zr, Ce, and Pr, and wherein said first binary metal oxide material layer has a first lattice constant.

24. The semiconductor structure of claim 23, wherein said second binary metal oxide material layer is formed of at least one of BaO, SrO, MgO, CaO, ZrO_2, CeO_2, PrO2, YSZ and an oxide blend comprising at least two of Ba, Sr, Mg, Ca, Zr, Ce, and Pr, and wherein said second binary metal oxide material layer has a second lattice constant that is different from said first lattice constant.

25. The semiconductor structure of claim 18, wherein said monocrystalline material layer comprises at least one of a semiconductor material, a compound semiconductor material, a metal, an oxide, and a non-metal.

26. The semiconductor structure of claim 20, wherein said template layer comprises a Zintl-type phase material.

27. The semiconductor structure of claim 26, wherein said Zintl-type phase material comprises at least one of $SrAl_2$, $(MgCaYb)Ga_2$, $(Ca,Sr,Eu,Yb)In_2$, $BaGe_2As$, and $SrSn_2As_2$.

28. The semiconductor structure of claim 20, wherein said template layer comprises a surfactant material.

29. The semiconductor structure of claim 28, wherein said surfactant material comprises at least one of Al, In, Bi, and Ga.

30. The semiconductor structure of claim 28, wherein said template layer further comprises a capping layer.

31. The semiconductor structure of claim 30, wherein said capping layer is formed by exposing said surfactant material to a cap-inducing material.

32. The semiconductor structure of claim 31, wherein said cap-inducing material comprises at least one of As, P, Sb and N.

33. The semiconductor structure of claim 18, wherein said monocrystalline substrate is characterized by a first lattice constant, said monocrystalline material layer is characterized by a second lattice constant that is different from said first lattice constant, said first binary metal oxide material layer is characterized by a third lattice constant that is different from said first and said second lattice constants, and said second binary metal oxide material layer is characterized by fourth lattice constant that is different from said first and said third lattice constants.

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34. The semiconductor structure of claim 33, wherein said first binary metal oxide material layer comprises BaO and said second binary metal oxide material layer comprises SrO.

35. The semiconductor structure of claim 19, wherein said substrate comprises silicon and said amorphous intermediate layer comprises a silicon oxide.

36. The semiconductor structure of claim 18, wherein said strained stack further comprises a third binary metal oxide layer.

37. The semiconductor structure of claim 18, wherein said first binary metal oxide material layer is formed of a binary metal oxide material having a rock-salt crystalline configuration.

38. The semiconductor structure of claim 18, wherein said second binary metal oxide material layer is formed of a binary metal oxide material having a rock-salt crystalline configuration.

39. A process for fabricating a semiconductor device structure comprising:

providing a monocrystalline substrate;

forming an amorphous intermediate layer overlying said substrate;

epitaxially growing a first monocrystalline binary metal oxide material layer overlying said amorphous intermediate layer, wherein said first monocrystalline binary metal oxide material layer has a first lattice constant; and

epitaxially growing a monocrystalline material layer overlying said binary metal oxide material layer.

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40. The process of claim 39, further comprising forming a template layer between said first binary metal oxide material layer and said monocrystalline material layer.

41. The process of claim 39, further comprising heat treating said first monocrystalline binary metal oxide material layer to convert said first monocrystalline binary metal oxide material layer to an amorphous binary metal oxide material layer.

42. The process of claim 39, further comprising epitaxially growing a second monocrystalline binary metal oxide material layer overlying said first monocrystalline binary metal oxide material layer, wherein said second monocrystalline binary metal oxide material layer has a second lattice constant that is different from said first lattice constant.

43. The process of claim 39, wherein said epitaxially growing a first binary metal oxide material layer comprises epitaxially growing a first binary metal oxide material layer of at least one of BaO, SrO, MgO, CaO, ZrO_2, CeO_2, PrO2, YSZ and an oxide blend comprising at least two of Ba, Sr, Mg, Ca, Zr, Ce, and Pr.

44. The process of claim 42, wherein said epitaxially growing said second binary metal oxide material layer comprises epitaxially growing said second binary metal oxide material layer of at least one of BaO, SrO, MgO, CaO, ZrO_2, CeO_2, PrO2, YSZ and an oxide blend comprising at least two of Ba, Sr, Mg, Ca, Zr, Ce, and Pr.

45. The process of claim 42, wherein said monocrystalline material layer comprises GaAs, said first monocrystalline binary metal oxide material layer comprises BaO, and said second monocrystalline binary metal oxide material layer comprises SrO.

46. The process of claim 39, wherein said epitaxially growing a first monocrystalline binary metal oxide material layer comprises epitaxially growing a first monocrystalline binary metal oxide material layer formed of a material having a rock-salt crystalline configuration.

47. The process of claim 42, wherein said epitaxially growing a second monocrystalline binary metal oxide material layer comprises growing a second monocrystalline binary metal oxide material layer formed of a material having a rock-salt crystalline configuration.

48. The process of claim 40, wherein said forming a template layer comprises forming a template layer of Zintl-type material.

49. The process of claim 48, wherein said forming a template layer comprises forming a template layer of at least one of $SrAl_2$, $(MgCaYb)Ga_2$, $(Ca,Sr,Eu,Yb)In_2$, $BaGe_2As_2$ and $SrSn_2As_2$.

50. The process of claim 40, wherein said forming a template layer comprises forming a template layer of a surfactant material.

51. The process of claim 50, wherein said forming a template layer comprising a surfactant material comprises forming a template layer of at least one of Al, In, Bi and Ga.

52. The process of claim 50, wherein said forming a template layer further comprises forming a capping layer.

53. The process of claim 52, wherein said forming a capping layer comprises forming a capping layer by exposing said surfactant material to a cap-inducing material.

54. The process of claim 53, wherein said exposing comprises exposing said surfactant material to at least one of As, P, Sb and N.